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Grounding Entails Counterpossible Non-Triviality

Forthcoming in *Philosophy and Phenomenological Research*

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Abstract: This paper outlines a non-reductive counterfactual account of grounding along interventionist lines, and uses the account to argue that taking grounding seriously requires ascribing non-trivial truth-conditions to a range of counterpossible counterfactuals. This result allows for a diagnosis of a route to scepticism about grounding, as deriving at least in part from scepticism about non-trivial counterpossible truth and falsity.

1. Introduction

It is part of the folklore of contemporary metaphysics that grounding goes beyond any purely modal connection such as one-way supervenience (Bennett & McLaughlin 2005). Many of the classic examples that underwrite this folklore are due to Kit Fine (e.g. Fine 2001). Necessarily, Singleton Socrates exists *iff* Socrates does; so no two worlds can differ with respect to whether Singleton Socrates exists without differing with respect to whether Socrates exists, and vice versa. Thus there is *two-way* supervenience between the existence of Socrates and the existence of Singleton Socrates. If the latter is grounded in the former without the former being grounded in the latter, as intuition suggests, then grounding is not one-way supervenience.

There is more, though, to our ordinary modal thought than one-way supervenience. Counterfactuals offer a promising route to getting a handle on the notion of grounding, and this paper outlines a non-reductive counterfactual account of grounding. Accepting non-trivial counterpossibles opens the way for counterfactual-based treatments of the difficult cases that sank the one-way supervenience analysis of grounding. Although grounding cannot be characterized in terms of necessitated material conditionals (strict conditionals) as in the supervenience approach, it can be characterized in terms of distinctive patterns of counterfactual conditionals. This approach, inspired by recent interventionist theories of causation, retains some of the spirit of the supervenience analysis: the ideological resources to which the approach appeals are just those of our ordinary counterfactual thinking, allowed to range beyond the limits of the possible.

The interventionist approach to grounding is described in §2 and applied to some examples in §3. The core of the paper is §4, in which I argue that modelling the structure of grounding cases requires ascribing non-trivial truth-conditions to a range of counterpossible interventionist counterfactuals. §5 connects the discussion to the recent debate over the (non-)triviality of counterpossibles, and §6 is a conclusion.

2. Interventionism about Grounding

Grounding and causation appear to have a lot in common. Their surface similarities—for example, our use of ‘because’ in connection with both notions—are obvious, but the commonality between the notions can potentially be traced deeper.¹ Here is a brief but illustrative list of their shared features. The relations of (strict) grounding and causation are both ordinarily thought to form partial orders; however, transitivity and anti-symmetry can be challenged for each notion by appeal to analogous types of cases, and structurally similar responses are available to these challenges. Likewise, structurally similar puzzle cases challenge counterfactual analyses for the two notions. Grounds and causes can both be informatively cited in explanations, and they stand in similar relations to laws, necessity and inference. The analogy with sufficient cause is often used to introduce the notion of full ground. Finally, and more elusively, both grounding and causation seem ‘spooky’ in a way that troubles austere empiricists.

The apparently systematic analogy between grounding and causation suggests that we might look to our well-developed menu of theories of causation—counterfactual theories, process theories, agential theories, and the like—in understanding the notion of grounding. This way of proceeding allows us to remain neutral about the basis for the grounding-causation analogy. Perhaps the two notions are analogous because they are species of some common genus of determination relation (Schaffer forthcoming, Bennett forthcoming), or perhaps they are analogous because grounding is a type of causation (A. Wilson MS), or perhaps there is no further explanation to be given for the analogy between them (Fine 2012). For present purposes, we can set this issue aside. To the extent that grounding and causation are similar to one another, similar theoretical tools ought to be useful for understanding them.²

¹ The analogy between grounding and causation has recently been mapped out in detail by Schaffer (forthcoming) and by A. Wilson (MS).

² To be precise, I will be assuming that causation and grounding are analogous at least with respect to their relationship with counterfactuals. My argument is compatible with the notions being disanalogous in various other respects: for example, in respect of their relation to energy-momentum transfer or in respect of our epistemic access to their instances.

I will focus on the *interventionist* approach to causation, associated especially with Woodward (2003), Hitchcock (2001), and Pearl (2009). Interventionism does not comprise a straightforward reduction of causation to counterfactual dependence. Nonetheless, it is still a form of counterfactual theory since it involves a non-trivial ‘systematic connection between causal claims and certain counterfactuals’ (Woodward 2003, p.70). My strategy will be to chart a similarly systematic connection between grounding claims and their corresponding counterfactuals.

As with David Lewis’s original counterfactual theory of causation (Lewis 1973b), interventionists focus on a restricted range of counterfactuals in order to avoid spurious causal dependencies arising from what Lewis calls *back-tracking counterfactuals* (Lewis 1973a, 1979/1986). To encode the distinction between back-trackers and non-back-trackers, interventionists make use of *causal models* consisting of a set of *variables*, a set of *structural equations* relating the variables, and an *assignment* of actual values to the variables. According to my interpretation of interventionism, the difference between back-tracking and non-back-tracking counterfactuals is derived from a more basic distinction between inappropriate and appropriate models. Non-back-tracking counterfactuals are those with an antecedent specifying an intervention on some variables in an appropriate model, and with a consequent specifying some values for other variables in that model. Interventionists offer no independent characterization of appropriateness; an appropriate model is just one which correctly captures the causal structure of the situation modelled.

We may reasonably ask what is being taken as primitive by interventionists—are the truth-conditions for interventionist counterfactuals specified in terms of metaphysically prior causal relations between variables in a causal model, or are the causal models instead reducible to primitively true interventionist counterfactuals? Woodward (2003) offers interventionism as a non-reductive analysis—as exposing a bi-directional relationship of conceptual interdependence with no priority running either way. I propose to think of the interventionist proposal somewhat differently, as remaining *non-committal* between alternative directions of explanation. The interventionist framework can be used to reduce causation to counterfactuals, or to specify truth-conditions for an interesting class of counterfactuals in causal-theoretic terms, or to articulate a two-way interdependence. My use of the framework will be neutral between these approaches, since the arguments that follow require only a connection between causation and counterfactuals that holds under all three interpretations. By taking this line, interventionists can exploit the connection between causation and counterfactuals without having to settle on which is ultimately to be reduced to which.

The notion of an intervention does a lot of work for interventionists. In effect, it plays the role allotted to small miracles in the Lewisian semantics for non-backtracking counterfactuals (Lewis 1973a, 1979/1986), the role of specifying that the antecedent be realized in a way that does not ‘drag along’ unwanted causal history. An intervention is a ‘clean’ alteration of the value of a particular variable that does not affect the values of upstream causal variables: for example, an intervention on the reading of a barometer leaves unchanged both the pressure in the room and the barometer’s own causal origins. It is immediately apparent that a characterization like this will not issue in a reductive theory of causation, since the notion of an intervention (a specific type of *alteration* of a variable value) is explicitly causal³. Nonetheless, interventionists typically maintain that their account is still informative because it shows us how various distinct causal claims are conceptually connected to one another. The approach will deliver verdicts about specific causal dependencies once we have specified an appropriate causal model.

In light of the close analogy between causation and grounding, if the non-reductive interventionist approach is helpful for explicating causation then it ought also to be helpful for explicating grounding. By applying interventionism to grounding scenarios, we might hope to derive some informative results about the nature of grounding. That will be my approach in the rest of this paper.

3. Grounding Models

From an interventionist perspective, the counterfactual dependency judgments entailed by grounding claims will be underwritten by a particular *grounding model*. In a companion paper (A. Wilson MS) I give several examples of grounding models, making use of the flexibility of the structural-equations framework to capture cases including grounding by omission, grounding by prevention, grounding pre-emption and grounding overdetermination. For present purposes we need only see how the interventionist approach applies to straightforward cases of grounding, since even the simplest grounding models suffice to reveal counterpossible non-triviality when looked at through the interventionist lens. The models presented in this section will serve to introduce the systematic connection between structural-equation models and interventionist counterfactuals and to clarify the notion of a grounding intervention; and, in §4, the models will be used to frame my main argument concerning counterpossible non-triviality.

³ Reutlinger (2012) argues that the notion of an intervention can be dispensed with to deliver a bare counterfactual theory that yields truth-conditions for causal claims equivalent to those yielded by Woodward’s theory; nonetheless, the resulting theory still fails to be reductive since it relies on a primitive distinction between appropriate and inappropriate models.

Every structural-equations model, formally speaking, consists of a set of variables representing features of reality, a set of structural equations linking the values of the variables according to the causal/grounding structure of reality, and an assignment function specifying which values the variables actually take. We may think of each variable as a question, and of the possible values of each variable as the various possible answers to that question (Briggs 2012a). Variables may in general be either discrete (whether Socrates exists) or continuous (how tall Socrates is). The facts that stand in grounding relations, in this framework, are thus identified with question-answer pairs: think of them, if you like, as ‘the fact that answer A is the correct answer to question Q’. For yes/no questions, we conventionally assign a value of 1 for ‘yes’ and 0 for ‘no’.

The structural equations of a model are written in the form $A=f(B,C, \dots)$. It is important to note that this ‘=’ does not denote identity, or indeed any symmetric relation. Instead, according to interventionists it expresses the asymmetric counterfactual dependence of variable A on variables B, C, Accordingly, each individual structural equation within a model encodes a set of counterfactuals of the form: *if B, C, ... were set to values b, c, ... by an intervention, A would take value $f(b,c,\dots)$* . Complex structural-equations models encode many such sets of counterfactuals. The central role played by these counterfactuals in the interventionist framework is what marks it out as part of the broad tradition of counterfactual approaches to causation. For the standard philosophical account of interventionist counterfactuals, see Woodward (2003 p.59-61); for detailed explorations of their semantics, see Briggs (2012a) and Santorio (MS).

The structural equations and assignment function of a structural-equations model may be represented by a directed graph with actual variable values at nodes. (The causal modelling literature, being oriented towards practical applications, tends to ignore possible cases of causal loops by requiring the graphs also to be acyclic.) Such graphical visualizations, while heuristically useful, leave out important aspects of the structural-equations models: the visualizations do not represent the alternative values that a variable could have taken, or the dependency relations between these unactualized variable values. Accordingly, many distinct causal models may correspond to a single directed acyclic graph, and we will also need to provide a full set of structural equations to properly characterize our grounding models.

The simplest possible type of case of causation involves one fact being a sufficient cause of another:

Window

Variables

C: Whether Suzy throws the rock

E: Whether the window smashes

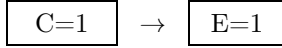
Structural Equations

$E=C$

Assignment

$C=1; E=1$

Graphical Representation



Models with exactly the same structure also describe the simplest possible cases of one fact being a full ground of another. All that changes is the variables involved. In one of the most notorious of all grounding cases, the existence of Socrates is taken to fully ground the existence of Singleton Socrates (the impure singleton set containing Socrates as a member). Singleton Socrates exists *because* Socrates does:

Singleton

C: Whether Socrates exists

E: Whether Singleton Socrates exists

Another classic application of grounding ideology is to the determinate/determinable relationship. According to the standard line of thought: being red is a way of being coloured, so a red brick gets to be coloured in virtue of being red. Accordingly the brick's being red is taken to fully ground the brick's being coloured. The brick is coloured *because* it is red:

Colour

C: Whether the brick is red

E: Whether the brick is coloured

To draw conclusions about grounding from considering these grounding models, we must turn to interventionism's distinctive twist: a systematic connection between structural-equations models and a special class of *interventionist counterfactuals*. The next section looks at the interventionist counterfactuals associated with grounding models, and shows that even the simplest grounding models encode non-trivial differences in truth-values amongst counterpossible counterfactuals.

4. Interventionist Counterfactuals

Early counterfactual accounts of causation suffered from the *problem of asymmetry*: while causal dependence is (at least by and large) an asymmetric matter, often the counterfactuals used to analyse causation appear to hold true symmetrically. For example, while the judgment that had I not slipped I would not

have fallen might be taken to support my slip being a cause of my fall, it may be equally true in certain scenarios that had I not fallen I would not have slipped. (Perhaps I was walking on open ice, and the slightest slip would certainly have resulted in a fall.) But the fall does not cause the slip in those scenarios. In recognition of the problem of asymmetry, Lewis restricted his original counterfactual analysis of causation (Lewis 1973b/1986) so that only a special class of non-back-tracking counterfactuals were sufficient (if true) for causal dependence to obtain. Unfortunately, Lewis never succeeded in specifying the class of non-back-tracking counterfactuals in a satisfactory and non-circular way (see Elga 2001 for discussion).

The appeal to structural-equation models provides interventionists with a distinctive solution to the problem of asymmetry. The interventionist account of causation uses structural-equations models to encode asymmetric patterns of counterfactuals of a special type: *interventionist counterfactuals*. These are counterfactuals with antecedents corresponding to combinations of interventions on model variable values and with consequents corresponding to combinations of model variable values. Our familiar causal locutions are then analyzed directly in terms of interventionist counterfactuals. True interventionist counterfactuals can suffice for relations of causal sufficiency or dependence of various kinds between the relevant variables; counterfactuals that are not interventionist counterfactuals do not suffice for causal relations of any kind. We can likewise understand our grounding models as encoding an asymmetric pattern of interventionist counterfactuals.

Starting with a grounding model, a clear distinction can be drawn between interventionist counterfactuals (those with antecedents specifying interventions on model variables and with consequents specifying values for model variables) and other counterfactuals. Recall the Singleton model from the previous section:

Singleton

Variables

C: Whether Socrates exists

E: Whether Singleton Socrates exists

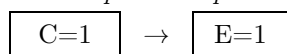
Structural Equations

$E=C$

Assignment

$C=1; E=1$

Graphical Representation



This grounding model, given an interventionist reading, encodes a range of interventionist counterfactuals. Their truth-values are determined by starting with the model, implementing the interventions specified in the antecedent on the actual

assignment of variable values, and then following up the downstream⁴ consequences of these interventions according to the structural equations of the model. The interventionist counterfactual is true if and only if this procedure yields an assignment of values to variables that verifies the consequent. So we have:

- CF1.** *If an intervention had prevented Socrates from existing, then Singleton Socrates would not have existed. — True*
- CF2.** *If an intervention had prevented Socrates from existing, then Singleton Socrates would have existed. — False*
- CF3.** *If an intervention had prevented Singleton Socrates from existing, then Socrates would not have existed. — False*
- CF4.** *If an intervention had prevented Singleton Socrates from existing, then Socrates would have existed. — True*

CF1 and CF2 are not counterpossibles: there is nothing metaphysically impossible about the intervention that prevents Socrates' existence⁵. However, evaluating the antecedents of CF3 and CF4 *does* take us to a metaphysically impossible assignment of values to variables. The intervention specified by their antecedents results in a situation in which Socrates exists but lacks a singleton set, and this requires breaking a metaphysically necessary connection between material objects and sets.

Why does the intervention specified by the antecedent of CF3 and CF4 give rise to a metaphysically impossible scenario, when there are metaphysically possible ways for Singleton Socrates to fail to exist? The answer is that interventions characteristically alter the value of the target variable, *but not via any of the pathways internal to the model*. Rather, interventions involve the action of an external influence that is not explicitly represented by the model, and which severs some dependencies encoded in the structural equations of the model. In the Window case (see §3), intervening on whether the window breaks severs the connection expressed by the structural equation 'E=C'. If Suzy throws, but a freak gust of wind diverts her rock, then C=1 but E=0. The intervention therefore falsifies this material conditional: "if C takes value 1, then E takes value 1". But the material conditionals associated with models of full grounding are intended to be necessary truths. On

⁴ 'Downstream' is to be understood as being fixed by the structural equations of the model. In the causal case, the downstream direction typically aligns with the direction of time (although time-travel scenarios, if possible, break that alignment). In the grounding case, the downstream direction typically runs from more fundamental to less fundamental (although grounding loops, if possible, break that alignment). Ultimately, which facts are in reality downstream of which depends on which model is appropriate; appropriateness is taken as primitive by interventionists, in accordance with their non-reductive orientation (see p.3).

⁵ To simplify matters, I set aside necessitism (the view that everything is necessarily something). See Williamson (2013) and Stalnaker (2012) for discussion.

orthodox views of grounding, if C fully grounds E then C necessitates E .⁶ So any intervention on a variable that is fully grounded in some other model variables will falsify some necessarily true material conditional. Any interventionist counterfactual with an antecedent that specifies such an intervention will be a counterpossible.

Since this point is the core of my argument, it is worth working through in detail. Focus on the falsity of CF3 (*“If an intervention had prevented Singleton Socrates from existing, then Socrates would not have existed”*). This counterfactual is false, according to the grounding model in question, since the variable setting described in the consequent (i.e. $C=0$) is not the result of applying the intervention described in the antecedent (i.e. *set $E=0$*) to our grounding model. The intervention specified by the antecedent is on the variable E (whether Singleton Socrates exists), which is downstream of the variable C (whether Socrates exists) that has its value specified by the consequent. As a result, the antecedent intervention leaves the value of the consequent variable untouched, and the counterfactual comes out false. The falsity of CF3 stands alongside the truth of CF1 as a key part of what the Singleton model represents about the asymmetric grounding structure of the world.

In the Window case, the analogue of CF3 is “if an intervention had prevented the window from smashing, then Suzy would not have thrown the rock”. Interventionists rely on the non-trivial falsity of this counterfactual in order to obtain the desired verdict that the smashing does not cause the throwing. It is not a counterpossible: there are plenty of metaphysically possible ways for the window to stay intact even if Suzy throws the rock. (Perhaps the freak gust blows, or Billy opens the window just in time.) But when grounding is concerned, interventions on any variables other than contingent variables with no variables upstream of them will involve falsifying one of the grounding model’s structural equations, resulting in metaphysically impossible combinations of variable values. The intervention specified in the antecedent of CF3 and CF4 excises Singleton Socrates from the world, while leaving Socrates in place but lacking a singleton. It thereby breaks the connection captured by the equation $E=C$, and entails the falsity of the (putatively necessary) principle of impure set theory that for every concrete object there is a singleton set containing that object.

⁶ Parsons (1999) and Briggs (2012b) deny that truthmaking entails the corresponding necessitated material conditional; so if truthmaking is a kind of full grounding then they constitute exceptions to this rule. And Leuenberger (2014) and Skiles (forthcoming) argue directly against the claim that full grounds necessitate that which they ground. However, these authors still grant that at least some cases of grounding do involve necessitation—mathematical and logical cases, for example—and models of these cases will encode counterpossible interventionist grounding counterfactuals.

As a final illustration, consider the Colour case discussed in the previous section, in which a brick being coloured is grounded in its being red. Consider the analogue of interventionist counterfactual CF3: “*If an intervention had prevented the brick from being coloured, then the brick would not have been red.*” According to the Colour model, the variable E (whether the brick is coloured) is downstream of the variable C (whether the brick is red). So intervening on E holds C fixed, giving rise to a situation in which the brick is red but not coloured, and our interventionist counterfactual is a (false) counterpossible: the antecedent intervention falsifies the necessarily true material conditional ‘if the brick is red, then the brick is coloured’. Being metaphysically impossible, this intervention is of an unfamiliar sort—it is not a way in which you or I could go about preventing a brick from being coloured!—but the unfamiliarity of the intervention does not prevent us from assessing its counterfactual consequences. My central point stands: the interventionist approach to grounding reveals that cases of full ground place distinctive constraints on what counterfactually follows from certain specific impossible interventions.

To be clear: the argument of this section is not that the true interventionist counterfactuals, the truth of which supports positive grounding connections, are always counterpossibles. CF1 and CF2 have antecedents that specify a metaphysically possible intervention. But since the grounding dependency involved in Singleton is required to be one-way, the model must fix truth-values for CF3 and CF4 also—and these counterfactuals are counterpossibles. So non-trivial grounding models do generically involve non-trivial counterpossible truth and falsity.⁷

5. Counterpossible Triviality

Counterpossible counterfactuals pose a difficult philosophical puzzle. Familiar semantic accounts of counterfactuals in terms of possible worlds break down when applied to counterpossible counterfactuals, for obvious reasons; and non-trivial counterpossibles falsify some natural principles connecting counterfactuals with the logic of metaphysical modality (Williamson 2008). In the light of such problems, a popular and strikingly simple response has been to regard all counterpossible conditionals as trivially true. Our differential responses to counterpossibles can then be explained away on pragmatic grounds. Call this the *conservative* approach.

⁷ There may be some exceptions to this generic if there are cases of partial grounding without full grounding; Leuenberger (MS) argues for the possibility of such cases. I need not take a stand on their possibility here; my argument goes through for any non-trivial grounding model (that is, for any model that appropriately represents a case of full grounding).

David Lewis was a conservative: he described himself as “fairly content to let counterfactuals with impossible antecedents be vacuously true” (Lewis 1973 p.25), noting that this approach is enforced (at least for inconsistent antecedents) by the combination of *ex falso quodlibet* and the attractive thesis that counterfactuals where the antecedent logically implies the consequent are automatically true; though he also called these reasons “less than decisive” (*ibid.* p.25). Stalnaker (1996a) adopts a similar position, for similar reasons. Conservatism has also recently been fiercely defended by Timothy Williamson, who writes:

The logic of quantifiers was confused and retarded for centuries by unwillingness to recognize vacuously true universal generalizations; we should not allow the logic of counterfactuals to be similarly confused by unwillingness to recognize vacuously true counterpossibles.

Williamson (2008) p.175

Adopting the conservative view trivializes the interventionist counterfactuals associated with cases of ground. If an intervention were to prevent there from being any sets, there would still be Socrates, right enough; but it is also true on the conservative view that, if an intervention were to prevent there from being any sets, then there would *not* be Socrates. Conservatism about counterpossible counterfactuals undermines the differences in truth-value between interventionist counterfactuals that are essential for providing structure to grounding models.

Of course, not everyone agrees that counterpossible counterfactuals have trivial truth-conditions. I will use the term ‘liberal’ to cover those philosophers, such as Priest, Nolan, Fine, Goodman, and Brogaard & Salerno, who affirm that there are some true counterpossibles as well as some false counterpossibles. Several advocates of this program (Nolan 1997, Goodman 2004, Priest 2005, Jago forthcoming) have developed a framework of *sui generis* impossible worlds to underwrite a familiar closeness-based semantics for assessing counterpossibles, while Restall (1997) proposes instead to reduce impossible worlds to sets of possible worlds.

At this point we come to a parting of the ways. Consider the following argument against counterpossible triviality (similar arguments could be developed using any case of full grounding):

1. The interventionist analysis of grounding is correct. (Premise)
2. The fact that Socrates exists fully grounds the fact that Singleton Socrates exists, but not *vice versa*. (Premise.)

3. If the interventionist account of grounding is correct, then if A fully grounds B (but not *vice versa*) then an intervention on A would alter the truth-value of B, but not *vice versa*. (Definition of interventionism.)
4. It is false that if an intervention had prevented Singleton Socrates from existing, then Socrates would not have existed. (From 1, 2, 3.)
5. ‘If an intervention had prevented Singleton Socrates from existing, then Socrates would not have existed’ is a counterpossible. (Premise.)
6. Not all counterpossibles are trivially true. (From 4, 5.)

The interventionist treatment of grounding exposes a tension between the popular thesis that there are genuine cases of full grounding and the popular thesis that counterpossibles are trivially true. Sceptics about non-trivial counterpossibles who prize straightforward and elegant connections between metaphysical modality and the logic of counterfactuals will be driven to reject grounding as a useful notion in metaphysics. In contrast, friends of non-trivial counterpossibles may continue to countenance widespread grounding on an interventionist model. They can allow for non-trivial patterns of truth and falsity even amongst counterpossible interventionist counterfactuals, thereby recovering the desired patterns of grounding.

I will not try to adjudicate the dispute between conservatives and liberals here; it runs much too deep. Instead, I want to use the existence of this dispute to diagnose a potential route to scepticism about grounding. The argument given above provides a rationale for those suspicious of non-trivial counterpossibles to be suspicious of grounding, since it can be seen to carry non-trivial counterpossible commitments. It also provides a rationale for those suspicious of grounding to be suspicious of non-trivial counterpossibles, since non-trivial counterpossibles threaten to let grounding in by the back door. While the former rationale is stronger than the latter—there could be various alternative reasons for rejecting the notion of grounding that keep the back door firmly closed⁸—the existence of these rationales suggests that we should expect a positive correlation between grounding scepticism and counterpossible trivialism. And, in my experience, philosophers do cleave in relatively orderly fashion along these lines. Liberals who are happy with non-trivial counterpossibles also tend to be happy with talk of grounding (Kit Fine, Daniel Nolan, Graham Priest and Jonathan Schaffer are paradigm examples), while

⁸ Hofweber (2009) and Daly (2012) offer one alternative reason for rejecting grounding talk: that it is unintelligible. My argument could be deployed to support their premise: if non-trivial counterpossible truth and falsity is unintelligible, so is grounding. However, Daly and Hofweber take grounding to be unintelligible for more general reasons that could motivate a rejection of grounding even for those content with non-trivial counterfactual truth and falsity.

conservatives (amongst them David Lewis⁹, Robert Stalnaker¹⁰, Timothy Williamson¹¹ and Jessica Wilson¹²) are suspicious both of non-trivial counterpossibles and of grounding. The interventionist approach to grounding permits an explanation of this sociological divide: grounding carries an implicit commitment to non-trivial counterpossible truth and falsity.

In tracing suspicions about grounding to suspicions about counterpossible counterfactuals, I do not mean to ascribe to the metaphysics community at large the views that grounding should be given an interventionist analysis and that interventionist models of grounding encode non-trivial counterpossibles. These claims are, as far as I know, original to the present paper. However, it does seem plausible that philosophers working on grounding have recognized, more or less distinctly, that grounding claims are tied up with counterfactual thought that ranges beyond the metaphysically possible. For example, Jessica Wilson (2014) and Thomas Hofweber (2009) both note this feature of grounding while arguing that grounding does not reduce to counterfactual dependence. (It is evident from their discussions that they are envisaging only a reduction to non-counterpossible counterfactual dependence.)

An analogy may clarify the epistemic position that I seek to diagnose. Suppose, to adapt an example from Putnam (1962, p.660), that cats are expertly-disguised robots sent by aliens to keep an eye on us, and that no humans are aware of this fact. Should the true nature of cats be revealed, it would be misguided to use this to explain why some human (call him Steve) who dislikes robots also dislikes cats. Steve couldn't have disliked cats *on the basis* that they were robots, because he had no idea that they were robots. But, as I see things, our epistemic position with respect to grounding and counterpossible non-triviality is more analogous to a scenario in which the cat-robots are not perfectly disguised, and in which Steve has

⁹ Lewis did not engage with questions about grounding, as he died before its recent rise to prominence. But in his formulations of metaphysical dependency theses—most notably his doctrine of Humean Supervenience (Lewis 1986 p.ix-xvi)—he uses only the purely modal notion of supervenience. And he is explicit that no stronger notion is required for reductionist projects: “If we limit ourselves to the question how mind finds a place in the world of physics, our work is done. Materialist supervenience offers a full answer.” (Lewis 1994 p.55).

¹⁰ Discussing a conception of supervenience that is strongly reminiscent of grounding—“as some kind of substantive relation—some kind of metaphysical superglue” (Stalnaker 1996b p.235)—Stalnaker tells us “I am inclined to agree... that the more metaphysically extravagant interpretation of supervenience is obscurantist, perhaps incoherent...” (*ibid.* p.235).

¹¹ In correspondence, Williamson has indicated that he is sceptical that the notion of ground as currently used by metaphysicians can play any useful theoretical role.

¹² Wilson is a well-known critic of the notion of ground (J. Wilson 2014). In correspondence, Wilson has indicated that she is also inclined to think that counterpossible counterfactuals are irrelevant for metaphysics, being either trivially true or otherwise defective.

consequently sub-consciously or semi-consciously perceived regular robotic aspects to the cats' behaviour. Disliking robots, he comes to dislike cats, even though he is not quite sure why; something in their behavior just freaks him out. When Steve discovers that cats are robots, he thinks to himself: "Ah! – this new information accounts for that strong feeling of mistrust I had about cats, on the source of which I couldn't quite put my finger. But now it makes perfect sense – I dislike cats because cats are robots, and I was indistinctly picking up on that."

6. Conclusion

It is time to sum up. The interventionist approach to grounding provides a way to revive the spirit, if not the letter, of modal analyses of grounding: instead of analyzing grounding in terms of necessitated material conditions, we can analyze it in terms of subjunctive conditionals, using structural-equation models to encode asymmetric patterns of counterfactual dependence. The key is to adopt a theory of counterfactuals that allows for non-trivial counterpossible truth and falsity, which can accordingly underwrite the needed variation in truth-value amongst the counterpossible interventionist counterfactuals encoded in grounding models.

The argument of this paper has highlighted a divide that runs through contemporary metaphysics, between conservatives who reject counterpossible thought and liberals who endorse it. Recognizing this divide provides us with a new handle on recent controversies over grounding. The intelligibility of grounding rests on the intelligibility of non-trivial counterpossible truth and falsity.^{13, 14}

¹³ Krakauer (2012) gives an analysis of grounding that also makes use of counterpossible conditionals. However, Krakauer develops his analysis rather differently and does not identify the problematic interventionist counterfactuals (e.g. CF3, CF4) on which my argument turns. In future work I hope to make a detailed comparison between our approaches.

¹⁴ For enlightening discussions of the material in this paper, I'm very grateful to Ralph Bader, Sam Baron, Elizabeth Barnes, Helen Beebe, Karen Bennett, Rachael Briggs, Ross Cameron, Vanessa Carr, Esa Diaz-León, Cian Dorr, Daniel Elstein, Nina Emery, Kit Fine, Ned Hall, Thomas Hofweber, Nicholas Jones, Luke Glynn, Carl Hoefer, Alex Kaiserman, Stephan Leuenberger, Dan López de Sa, Elizabeth Miller, Kristie Miller, James Norton, Josh Parsons, Martin Pickup, Oliver Pooley, Alex Reutlinger, Gonzalo Rodriguez-Pereyra, Paolo Santorio, Raul Saucedo, Jon Shaheen, Alex Skiles, Naomi Thompson, Jason Turner, Pekka Väyrynen, Robbie Williams, and Jessica Wilson, and questioners in Barcelona, Birmingham, Brisbane, Leeds, Newark, Oxford and Edinburgh. My particular thanks go to Jonathan Schaffer, who independently developed a very similar interventionist approach to grounding and who has since been unfailingly generous and helpful in correspondence. Schaffer's own presentation of the approach (Schaffer 2016) does not draw attention to the ubiquity of counterpossibles such as CF3 and CF4, but we are in full agreement on the other main points above: the depth of the grounding-causation analogy, the intimate connection between grounding and counterfactuals, and the way in which the structural-equations formalism carries over to grounding. (For some points on which we do disagree, see A. Wilson (MS).)

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